PROJECT GUIDANCE

Kentucky Water Resource Information System (WRIS)
Update 2006
Performed by Kentucky's Area Development Districts
For the Kentucky Infrastructure Authority

Kentucky Water Resource Information System
Kentucky Infrastructure Authority
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Introduction

This update of the Kentucky Water Resource Information System (WRIS) is unique in that the entire Geographic Information System (GIS) has been migrated from a file-based ArcInfo Coverage format to the new ArcGIS Geodatabase. Additionally, the old non-spatial database that was created and maintained in MS Access has now been moved to a web-based form that allows for updates to be performed throughout the contract period. These "upgrades" to the WRIS will improve the data's integrity, allow for greater levels of access, and ease the tasks of input and associated maintenance.

As with past updates, this effort will entail complete cooperation with both GIS and Water Management Planning Staff within the ADDs. Data housed in the WRIS must be obtained from a variety of sources and input into the non-spatial database or the geodatabase as appropriate. Resourcefulness is the key to success in this update. Information may not be readily obtainable from all water and wastewater systems for each and every attribute. In some instances an educated guess will be made and that must be documented accordingly within the metadata. The issues surrounding data collection for the WRIS are well understood but it is important that every effort be made to fill any data-gap that exists.

GIS Software

Each ADD must have a licensed copy of ArcGIS 9.1+. It is suggested that all updates and patches be applied as released by ESRI. Earlier versions of ArcGIS will NOT work with the new Geodatabase and its topological model. No other ArcGIS extensions are required for this contract. The WRIS Geodatabase shall NOT be exported to, or edited within, any other software package at any point during the contract.

Geodatabase Projection & Base Layers

The WRIS Geodatabase was created and will be maintained within Kentucky's Single Zone Projection (1600) and shall NOT be reprojected for any reason during the contract period. ADD's have been given prior notice of this intent and should have already downloaded all single zone Digital Ortho Images and Kentucky Raster Graphics as required for base imagery.

The organization of this imagery at the ADD should be carried out through the use of Image Catalogs or through storage in an SDE Raster instance. There has been success in using the Image Catalog function within ArcGIS. The imagery can be accessed @: ftp://ftp.kymartian.ky.gov/fsa/ , ftp://ftp.kymartian.ky.gov/doq1z/ & ftp://ftp.kymartian.ky.gov/krg/.

Another set of layers that is very important to this project is that of City and County Boundaries. The ADDs were asked to download the most recent county boundaries for recent work relating to wastewater planning areas. It is VERY important that ONLY these county boundary layers be utilized for work relating to WM Planning Areas and other such "area-based" GIS exercises. This data can be obtained @: http://gis.ky.gov/data/bnds.htm .

Topology in the WRIS Geodatabase

The geodatabase supports an approach to modeling geography that integrates the behavior of different feature types and supports different types of key relationships. In this context, topology is a collection of rules and relationships that, coupled with a set of editing tools and techniques, enables the geodatabase to more accurately model geometric relationships found in the world.

The following topology rules have been set for the water geodatabase:

meters-point must be covered by watlin
pumpstat-point must be covered by watlin
purchsrc-point must be covered by watlin
surfsrc-point must be covered by endpoint of watlin
wellsrc-point must be covered by endpoint of watlin
watpump-point must be covered by watlin
wattank-point must be covered by watlin
wtp-point must be covered by watlin
watlin-must not self-overlap
watlin-must not self-intersect

The following topology rules have been set for the wastewater geodatabase:

kimop-point must be covered by sewlin
liftstat-point must be covered by sewlin
stp-point must be covered by sewlin
outfalls-point must be covered by endpoint of sewlin
sewlin-must not self-overlap
sewlin-must not self-intersect

Adding the Topology Toolbar

You will need to add the Topology toolbar to ArcMap. To add the Topology toolbar, on the Editor toolbar, click the Editor menu, point to More Editing Tools, and click Topology. The Topology toolbar appears.

Validating Topology

Before you can see your topology errors, you must validate the topology. To do this, click the 'Validate Entire Topology' button. Validating the topology means checking the features to identify any violations of the rules that have been defined for the topology. Once the topology is validated you can see where the topology errors are.

You can use the error inspector to get a list of all topology errors for the entire extent or for the visible extent only. You can search for all errors by clicking the 'Search Now' button. The error inspector tells you the rule that has been violated. If you right-click on a rule you can zoom to the error, pan to the error, select the feature that is an error, show the rule description or mark the error as an exception. There are very few instances where an error should be marked as an exception. One example would be a wellsrc that is not snapped to a waterline because it is presently inactive.

In order to snap the points to the lines, you will have to set up snapping. To set up snapping, on the Editor toolbar, click the Editor menu and click on 'Snapping…'

For more information, please refer to the ArcMap help.

Functionality Added to the Geodatabase

Two new fields have been added to each feature classs in the geodatabases. These are DATECREATED and DATEMODIFIED. The DATEMODIFIED field will replace the LAST_UPDT field we previously had in the metadata items. These fields will be automatically populated when you create and modify features. We have taken the dates in the LAST_UPDT field and put it into the DATEMODIFIED field. These fields will not take a date you type in.
***NOTE: The DATEMODIFIED and DATECREATED fields to not automatically calculate at this time. We are working on resolving this. You must set each field individually

The water and sewer geodatabases will be constantly synced to the nonspatial database. The IDs, OWNER and ADDNAME will all be populated based on what is in the nonspatial database. If there is a system missing from the nonspatial database it will also be missing in the GIS domain of OWNERs & IDs. Also, only systems that are 'ACTIVE' will appear in the domain list.

When you choose a PWSID or DOWPERMID (KPDES/KIMOP number) in a feature class the OWNER and ADDNAME will automatically be filed in based on the information in the nonspatial database.
***NOTE: The OWNER and ADDNAME fields will not automatically calculate at this time. We are working on resolving this. You must set each field individually.

Issues Noted During the Geodatabase Conversion

Date Fields

In order to load date fields into the geodatabase we had to do a lot of cleanup before ArcCatalog would accept the values.

Many ADDs have the date 12/30/1899 (METER testing date, WATTANK construction, cleaning, and inspection dates, WTP construction and major export dates, etc…) Although this date may be correct, it is odd that this date appears in many of the ADDs date fields. Please query for this date in all date fields and if you find this value, make sure it is correct.

The LAST_UPDT fields we previously had in all existing coverages was a character field and was supposed to have month/year. We now have a field called DATEMODIFIED (date field, not just month/year) that will automatically be filled in when you make a change to a feature (spatial or attribute). We took the LAST_UPDT in the coverage, added day to the date (made them all 01) and then put this value into the DATEMODIFIED field. In some instances the value in LAST_UPDT was month/day and no year was provided. In these instances we guessed at the year to put the date in.

In general, there are a lot of dates in date fields that are questionable. For example we have some meters that were last tested on 01/01/1900, we have water tanks that were constructed in the year 2099, we have

water tanks that were last inspected and/or cleaned in the year 2099, we have treatment plants that were expanded before they were ever constructed, we have treatment plants that were both constructed and expanded on the same date, etc…You need to look all the dates you have in all feature classes and make sure they are correct. This is very important!

New Fields in WATTANK

There was a field in WATTANK called AVSETT for the Altitude Valve setting (inlet/outlet psi). The inlet and outlet psi can be different so we have created 2 fields on for the inlet and one for the outlet (AVIN and AVOUT) and have deleted the field AVSETT. I put the value that was in AVSETT into both the AVIN and AVOUT fields. You will need to check these fields to make sure the values are correct.

0 Length Arcs

Several ADDs had arcs that had a length of 0 (WATLIN, WATPROP, SEWLIN, SEWPROP). The geodatabase will not bring in arcs that have 0 as their length so none of these arcs are in the geodatabase.

WATDIST

As we have discussed on several occasions, the water district boundaries are jurisdicational boundaries ONLY for **water districts**. Several ADDS gave us boundaries for all water systems (probably service areas, not jurisdictional boundaries). We are looking for the boundaries the water districts filed with PSC when they were formed. I have deleted all polygons except those for water districts. I have also deleted all "doughnuts" or "island polygons" since the geodatabase supports this. When you add a new polygon in the geodatabase, the list of IDs is limited to only water districts (pulled from the nonspatial database). Also, we only want boundaries for ACTIVE water districts. Some ADDs did boundaries for systems that are outside of their ADD. You should only do boundaries for those water districts your ADD collects data for. If in doubt refer to the nonspatial database for the systems you should collect data for.

SEWPLANPOLY

These are polygons for sewer projects that have a 3-20 year schedule. NO 0-2 year projects should be mapped as polygons. There should only be polygons for projects. Some ADDs gave us all their county boundaries and had polygons inside those. There are MANY polygons that do not have a PNUM. ALL sewplanpoly polygons should have a PNUM and should have a project profile. Delete all polygons that do not have an associated project profile. I deleted all polygons that did not have an ADDNAME. I also deleted any "doughnut" or "island polygons". You will need to compare the project profile database with your SEWPLANPOLY.

Proposed Data

We found that the date field in the proposed coverages was incomplete or incorrect in many instances. Because of this we used the DATESUBMITTED and DATECREATED fields from the project profile database to populate the date fields in the proposed data.

Existing VS. Proposed

One of the most critical elements of the WRIS is the Project Profile database and its integration with the WRIS GIS database. Keeping these two datasets in-sync is very important and is the responsibility of each ADD. When a project is FULLY constructed it must be moved from its proposed layer in the GIS to the appropriate existing layer in the GIS. This should NOT be done if the project is under construction, rather only after it has been fully constructed and put into service. The same holds true for the Project Profile database. When a project is fully constructed its STATUS must be set to CONSTRUCTED so that it is not considered for funding after the fact. Conversly, the proposed GIS data should NOT include any projects that do not at least have a SAVED project profile. It is very important that ADD GIS and Water Management Planning Staff work together to keep both of these datasets current. Internal communication within the ADD and external communications with the Project Administrators is a must in order to keep the data up-to-date. A CONSTRUCTED project must never show up in any proposed GIS layer and it must never be listed as SUBMITTED (ie. Eligible for Funding) in the Project Profile Database.

Network Connection

A broadband network connection is highly suggested for the transfer of base data, imagery, and WRIS dataset uploads as may be required for this contract. All WRIS Geodatabase related data will be uploaded to: ftp://wris.ky.gov/wrisup06/<youraddname>/ . Each ADD folder has two subfolders: checkins and checkouts. Do NOT create any new subfolders and do NOT let anyone outside ADD Staff have knowledge of or access to this FTP site. Please test your connection and let us know if you have any issues.

Non-Spatial Database Access

No software other than a web-browser is required in order to access the WRIS Non-Spatial Database. The Water Non-Spatial can be accessed @: http://wris.ky.gov/watsys/ and the Wastewater Non-Spatial can be accessed @: http://wris.ky.gov/wwsys/

Forms, Templates, & Other such things

Database item definitions, GIS templates, FIPS code listings, and any other such documents for this project will be posted to: http://kia.ky.gov/wris/addgis.htm . Please refer to any documentation or guidance on this site before contacting KIA Staff.

Project Scope & Timetable

The full scope of this project and a timetable from the contract can be located at the end of this document. A thorough review of the scope is highly suggested. If there are any questions regarding the scope, please let us know. If at any point during the contract period it is expected that deadline cannot be met, please contact KIA immediately so that appropriate arrangements can be made.

Who to Contact?

Use the listing below as contact guidance during the contract period:

For questions regarding the ArcGIS Geodatabase:

Rusty Anderson – rusty.anderson@ky.gov

For questions regarding access to or input problems concerning the Water or Wastewater Non-Spatial Database:

Sasan Fakharpour – sasan.fakharpour@ky.gov

For questions regarding content of the Water or Wastewater Non-Spatial Database:

Sheryl Chino – sheryllchino@gradd.com

For questions regarding the Ky e-Clearinghouse & Water Management Planning:

Robert Potter – robert.potter@ky.gov

Scope of Work

(Excerpt from Contract)

Re: Water Resource Information System – Verification and Update:

The District shall perform all tasks and related activities to successfully complete the following elements in a manner that conforms to the specifications and within the time set out herein. All effort relating to this scope shall proceed under the direction of Mr. Kent Anness, KIA, and with the guidance of the WRIS Technical Advisory Committee. The District shall obtain, update, and develop the following:

A. **METADATA:** Each ADD shall update and maintain all record-level metadata items on all WRIS GIS layers. The metadata fields, shall be verified by ADD GIS Staff at the beginning of this project and actively maintained accordingly for each layer throughout the project's duration. These metadata fields shall be populated for all updates and corrections that are made to any WRIS GIS Layer at any point in the future. A WRIS GIS Layer will not be classified as complete pursuant to this Amendment unless all specified metadata fields have been populated.

B. **Arc/Node Topology:** Any node in the WATLIN, WATPROP, SEWLIN, and SEWPROP coverage that share the same coordinate with a facility (such as a waterline running to a tank or treatment facility) shall be snapped to the facility so as to illustrate accurately the existing physical relationship of the components. A visual movement of the node to the facility will not be accepted. Additionally, completed/updated GIS Layers will not be accepted if inappropriate intersections and dangle-nodes exist. All sewer lines shall be checked to determine appropriate flow direction. Much of this will be enforced through the use of Geodatabase rules and other constraints in the ArcGIS Desktop Environment.

C. **Questionable Line & Facility Locations:** A list of questionable and incorrect facility locations may be provided to the District. The locations of these identified facilities shall be determined using GPS methodologies and or heads-up placement using available Digital Ortho Images.

D. **Balance of Systems:** A list of several, generally small, water and wastewater systems may be provided to the District. The systems on the list were not mapped during previous inventories. The District shall locate the system(s) in the GIS and provide basic attribute information as directed by the Authority.

E. **Update/Add/Verify:** The District shall verify all current data and update/add all water and wastewater infrastructure that has been constructed since completion of the past inventory. All line extensions, plant upgrades, tank replacements, and other infrastructure improvements shall be input into the WRIS. Any information provided to the District from whatever source which the District considers questionable should be brought to the attention of the WRIS Staff in a timely manner.

F. **Water Management Area Boundaries:** The District shall have the regional Area Water Management Council confirm the Water Management Area Boundary GIS Layer at one of their quarterly meetings during the contract period.

G. **Non-Spatial Data Tables:** The District shall update and verify all non-spatial data contained in the WRIS (System Information, Operations & Maintenance, & Planning) via the on-line application provided by the Authority. Updates will be ongoing throughout the agreement period.

H. **Review by System Operator/Manager:** The District shall prepare a map of each water and wastewater system in the region using symbology provided by the WRIS. The maps will be utilized during the field update and verification process and will be provided to each system for review. Once changes/updates have been finalized for a given system the District will request the system manager and/or board chair to execute a signature block on the updated map which indicates that the map is accurate to the best knowledge of the signatory.

I. The District shall utilize georeferenced CAD files provided by the Authority to input water and wastewater infrastructure data from final design plans and/or as-builts as provided according to grant and loan assistance agreements with the Authority.

J. **Data Deliverables:** The data deliverable for each of the aforementioned tasks (A, B, C, D, E, F, G, H and I) will be provided to the AUTHORITY in the form of an ESRI Geodatabase format. The data must be input using WRIS provided GIS templates and tools for each of the data deliverables. In addition to utilizing the WRIS provided templates, the District shall adhere to the following guidelines and standards:

    1. The District shall adhere to the standards set forth by the KYOGI for the statewide base map, thereby insuring that the data generated in the project shall overlay all existing and forthcoming data sets from the WRIS, DOW, PSC, KNREPC, ADDs, KGS, KYOGI and other agencies in the Commonwealth.

    2. All GIS Layers for this project shall conform to the required projection, Kentucky Single Zone State Plane – US Survey Feet – NAD 83 (1600); and all layers shall be developed using the WRIS GIS templates and tools when and as same are provided by the Authority.

    3. The District shall utilize the most accurate and up-to-date road centerline base map generated by the Kentucky Transportation Cabinet, in the same projection. The District shall use the KRG and DOQ products as a common base map to augment the road centerline files.

4. The District shall deliver, via FTP transfer (or other method as designated all data deliverables to the AUTHORITY) and provide supplemental hard-copy output of the data as may be specifically and reasonably requested by the Authority.

5. The District shall utilize ESRI's ArcGIS Desktop Version 9.0+ for all GIS editing performed under this contract. Editting or manipulation of the WRIS datasets outside this GIS environment will be grounds for immediate cancellation of the agreement with the District. The District shall demonstrate proficiency with the aforementioned tools and/or have at least two ESRI-certified classes on using ESRI's ArcGIS Software. Authority GIS Staff will determine the fittness for performance of the District.

K. **Project Control and Quality Assurance:**

1. The Authority's Executive Director shall serve as the overall project coordinator. The Authority's GIS Manager shall serve as the single point of contact for all matters relating to the development and maintenance of the WRIS.

2. For intra-regional coordination, the District shall utilize its Water Management Planning Council(s) to assist in the review and analysis of all data collected and to ensure the proper implementation of water and sewer project development.

3. All data submitted by the District will be subject to review by Authority staff and the WRIS Technical Advisory Committee. All data sets must conform to the project criteria and specifications as determined by the Authority. Data sets, which do not so conform, and/or which do not use the GIS database templates provided by the Authority will not be accepted.

L. **Submissions and Review of Data:**

1. The District shall continually strive to maintain a data set that is current by updating the spatial and non-spatial on an ongoing basis. A current data set shall be submitted to the Authority as required by Appendix B. The Authority and District shall use a check-in and check-out procedure to make sure no data are changed during the data update process.

2. At least once every two years, the Authority shall conduct a quality control audit of the data. Data that do not conform to the requirements listed above shall be corrected by the District and resubmitted to the Authority.

3. The Authority's quality control audit shall be conducted on a schedule set by the Authority.

Activity	**Completion Date**
Project Start	July 1, 2005
Perform all tasks necessary to complete WRIS update	November 30, 2005
Upload completed geodatabases to WRIS Server for 1st Review	November 30, 2005
Provide Final Map to each Service Provider	December 19, 2005
Develop GIS Mapping for Project Profile Development	Through Contract Period
Input Data from Georeferenced CAD Files	Through Contract Period
Prepare Maps/Present Mapping as required to support the Planning Process	Through Contract Period
Upload completed geodatabases to WRIS Server for 2nd Review	April 01, 2006
Make All noted updates/revisions as noted during WRIS review	June 01, 2006

Note: Revised from contract to reflect new target dates.